Patent Claims

1. Pressure sensor comprising

a pressure measurement cell having an essentially cylindrical platform of a first diameter and a first thickness, and a measuring membrane of a second diameter and a second thickness joined to an end face of the platform,

an elastic sealing ring of a third diameter and a third thickness,

a support ring of a fourth outer diameter, a fourth inner diameter and a fourth thickness, wherein the support ring is securely connected with the end face of the pressure measurement cell facing away from the measuring membrane,

a clamping ring having a first engagement means, and

a housing for accommodating a pressure measurement cell, wherein the housing has an axial bearing surface for the seal and second engagement means, which engages with the first engagement means,

wherein the pressure measurement cell is axially clamped between the elastic sealing ring, which is arranged between the axial bearing surface of the housing and the membrane-bearing end face of the pressure measurement cell, and the support ring, by means of the clamping ring,

characterized in that

a stiff decoupling element is arranged between the clamping ring and the support ring, and

the dimensions of the support ring and the decoupling element

are coordinated with the dimensions of the sealing ring and the pressure measurement cell such that a radial deformation of the membrane-bearing end face caused by the axial clamping of the pressure measurement cell is so small, that the span error of the pressure sensor on the basis of a reduction of the axial clamping force by at least 10% amounts to not more than about 0.02% and the temperature hysteresis of the span amounts to not more than about 0.03%.

2. Pressure sensor as claimed in claim 1, wherein the inner diameter of the support ring is selected such that the span error in the case of a reduction of the clamping force by at least 20% amounts to not more than about 0.02%.

3. Pressure sensor as claimed in claim 1, wherein the inner diameter of the support ring is selected such that the span error in the case of a reduction of the clamping force by at least 10%, or by at least 20%, amounts to not more than about 0.01%.

4. Pressure sensor as claimed in one of the claims 1 to 3, wherein the temperature hysteresis of the span amounts to not more than 0.02% and especially preferably not more than 0.01%.

5. Pressure sensor as claimed in one of the claims 1 to 4, wherein the platform and the measuring membrane are made of the same material, especially a ceramic material.

6. Pressure sensor as claimed in one of the claims 1 to 5, wherein the support ring and/or the decoupling element are made of the same material as the platform.

7. Pressure sensor as claimed in one of the claims 1 to 6, wherein the support ring has at least the thickness of the platform.

8. Pressure sensor as claimed in one of the claims 1 to 7, wherein the decoupling element comprises a decoupling plate.

9. Pressure sensor as claimed in claim 8, wherein the decoupling plate has a diameter equal to the outer diameter of the support ring.

10. Pressure sensor as claimed in claim 8 or 9, wherein the decoupling plate is not secured to the support ring.

11. Pressure sensor as claimed in one of the claims 1 to 7, wherein the decoupling element comprises a decoupling ring.

12. Pressure sensor as claimed in claim 11, wherein the decoupling ring has about the same dimensions as the support ring.

13. Pressure sensor as claimed in one of the claims 11 or 12, wherein means for minimizing friction is provided between the support ring and the decoupling ring.

14. Pressure sensor as claimed in one of the claims 1 to 9, wherein the coefficient of static friction between the support ring and the decoupling ring amounts to less than 0.2.

15. Method for the iterative optimizing of the dimensions of a support ring and a decoupling element for a pressure sensor of one of the preceding claims, comprising the steps of:

(i) Determining a geometry for the support ring and for the decoupling element;

(ii) calculating a first span change of the pressure sensor under a first axial clamping force;

(iii) calculating a second span change of the pressure sensor under a second axial clamping force;

(iv) determining the span error by comparing the first span change with the second span change;

(v) evaluating the span error;

(vi) determining the temperature hysteresis of the span and evaluating the temperature hysteresis of the span, if necessary under the condition that the span error be sufficiently small,

(vii) varying the geometry of the support ring and, if necessary, the decoupling element, and repeating the steps (ii) to (vii), until a suitable geometry is found for a sufficiently small span error and a sufficiently small temperature hysteresis of the span.